(19) Europäisches Patentamt
European Patent Offic
Offic européen de br v ts

(11) EP 0 778 148 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
11.06.1997 Bull tin 1997/24

(51) Int Cl.6: **B41J 2/175**

(21) Application number: **96306871.3**

(22) Date of filing: **20.09.1996**

(84) Designated Contracting States:
CH DE FR GB IT LI

(30) Priority: **04.12.1995 US 566521**

(71) Applicant: **Hewlett-Packard Company**
Palo Alto, California 94304 (US)

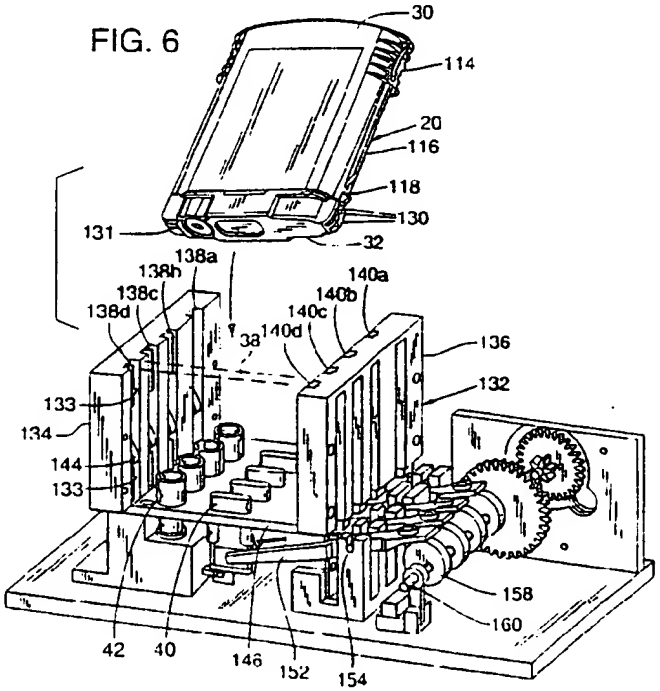
(72) Inventors:
- **Hmelar, Susan**
  Corvallis, OR 97333 (US)
- **Merrill, David O.**
  Corvallis, OR 97330 (US)
- **Schmidt, Glen E.**
  Corvallis, OR 97330 (US)
- **Underwood, John A.**
  Vancouver, WA 98686 (US)
- **Green, Mark J.**
  Corvallis, OR 97330 (US)
- **Cocklin, Thomas G.**
  Ridgefield, WA 98642 (US)

(74) Representative: **Colgan, Stephen James et al**
CARPMAELS & RANSFORD
43 Bloomsbury Square
London WC1A 2RA (GB)

(54) Keying system for ink supply containers

(57) Ink supply containers (20) for reservoirs of ink are provided with features (130, 131) that serve as keys and keyways. A docking station (132) is carried in a printer. The docking station defines bays into which supply containers may be inserted. Each bay is associated with an ink delivery system that is unique to a particular type of ink. Each bay has formed keys (138) and keyways (140) that correspond to keys and keyways of the containers. The keying system prevents a user from inserting into the bay any container other than the container having the correct ink type.

FIG. 6



EP 0 778 148 A1

Description

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to a system for ensuring that a replaceable ink supply container is properly oriented when inserted into an ink-jet printer.

A typical ink-jet printer has a pen mounted to a carriage which is moved back and forth over a printing surface, such as a piece of paper. The pen carries a print head. As the print head passes over appropriate locations on the printing surface, a control system activates ink jets on the print head to eject, or jet, ink drops onto the printing surface and form desired images and characters.

Some ink-jet printers use stationary ink supplies that are mounted away from the carriage and that supply ink to a refillable ink reservoir built into the pen. The ink may be supplied from the supply container to the pen through a tube that extends between the pen and the container.

Color ink-jet printers typically combine four ink colors to create a multitude of colors on the printing surface. Such printers can include a replaceable supply container for each color (typically black, cyan, yellow and magenta) used by the printer. A group of pens, each dedicated to a particular color, are mounted to the printer carriage. A separate ink delivery system for each color of ink is required.

Specifically, the entire path for one color of ink from its supply container to the pen and out the print head is dedicated for use by a single color of ink. Accordingly, a four-color ink-jet printer is configured to incorporate four discrete ink delivery systems, one for each color.

Some ink-jet printing systems provide for different classes or families of ink for use with different models of printers. For example, a printer designed to provide a very high quality print output may use ink having chemical and physical properties that are unlike the inks used with less-costly printer designs or families.

Contaminating one color ink with another, such as by introducing an ink of one color into the ink delivery system of another color, can ruin the color print quality. Moreover, directing the ink of one family into the delivery system of another family, can be disastrous for a printer. For example, if two black inks from different families were mixed together as a result of replacing one supply with the other, the mixture could react to form a precipitate and clog the ink delivery system, resulting in failure of the printer.

The present invention provides a keying system for ensuring that an ink supply ink container for a delivery system for a given family and color of ink will not be connectabl with th delivery syst m for ink of a differ nt color or family.

Other objects and aspects of th invention will b - come apparent to those skilled in the art from th detailed description of the invention which is presented by way of example and not as a limitation of the present invention

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of an ink supply container that carries a component of a preferred embodiment of the keying system of the present invention.

Figure 2 is an exploded perspective view of the ink supply container of Figure 1.

Figures 3A-3D are bottom views of the supply container caps showing various key and keyway components of a preferred embodiment of the keying system of the present invention.

Figure 4 is a perspective view of part of a printer docking station that includes another component of a preferred embodiment of the keying system of the present invention.

Figure 5 is a top partial view of one wall of the docking station detailing part of the keying system of the present invention.

Figure 6 shows the ink supply of Figure 1 being inserted into a docking bay of a docking station.

Figure 7 is a cross sectional view showing the ink supply of Figure 1 fully inserted into the docking bay.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

An ink supply container that carries a component of the keying system of the present invention is illustrated in Figures 1 and 2 as reference numeral 20. The ink supply container 20 (occasionally referred to merely as ink "supply") has a chassis 22 that carries an ink reservoir 24 for containing ink. The chassis also carries a pump 26, and a fluid outlet 28. The chassis 22 fits within the lower open end of a hard protective shell 30. A cap 32 is affixed to the lower end of the shell. The cap 32 is provided with an aperture 34 to allow access to the pump 26 and an aperture 36 to allow access to the fluid outlet 28.

The ink supply 20 is inserted into the appropriate bay 38 of a docking station 132 of an ink-jet printer, as illustrated in Figures 6-7 (and described more fully below). Upon insertion of the ink supply 20, an actuator 40 within the docking bay 38 is brought into contact with the pump 26 through aperture 34. In addition, a fluid inlet 42 within the docking bay 38 is coupled to the container fluid outlet 28 through aperture 36, thereby to create an ink delivery path from the ink supply 20 to the corresponding pen on the printer carriage. Operation of the actuator 40 causes the pump 26 to draw ink from the reservoir and deliver the ink through the fluid outlet 28 and the fluid inlet 42 to the ink-jet pen through a tub , as discussed b low.

Upon depletion of the ink from th r s rvoir 24, or for any oth r reason, the ink supply 20 can be easily removed from the docking bay 38. Upon removal, the

fluid outlet 28 on the container and the fluid inlet 42 of the docking station close to prevent any residual ink from leaking into the printer or onto the user. The ink supply container may then b discarded or stored for reinstallation at a later time. In this mann r, the ink supply 20 provides a user of an ink jet printer a simple, economical way to provide a reliabl , and easily replaceable supply of ink to an ink-jet printer.

As illustrated in Figures 2 and 7 the chassis 22 has a main body 44. Extending upward from the top of the chassis body 44 is a frame 46 which helps define and support the ink reservoir 24. In the illustrated embodiment, the frame 46 defines a generally square reservoir 24. Each side of the frame 46 is provided with a face 48 to which a sheet of plastic 50 is attached to enclose the sides of the reservoir 24. The illustrated plastic sheet is flexible to allow the volume of the reservoir to diminish as ink is depleted from the reservoir. This helps to allow withdrawal and use of all of the ink within the reservoir by minimizing the amount of backpressure created as ink is depleted from the reservoir. The illustrated ink supply 20, is intended to contain about 30 cubic centimeters of ink when full.

In the illustrated embodiment, the plastic sheets 50 are heat staked to the faces 48 of the frame in a manner well known to those in the art. The plastic sheets 50 are, in the illustrated embodiment, multi-ply sheets having a an outer layer of low density polyethylene, a layer of adhesive, a layer of metallized polyethylene terephthalate, a layer of adhesive, a second layer of metallized polyethylene terephthalate, a layer of adhesive, and an inner layer of low density polyethylene. The layers of low density polyethylene are about 0.0005 inches thick and the metallized polyethylene terephthalate is about 0.00048 inches thick. The low density polyethylene on the inner and outer sides of the plastic sheets can be easily heat staked to the frame while the double layer of metallized polyethylene terephthalate provides a robust barrier against vapor loss and leakage. Of course, in other embodiments, different materials, alternative methods of attaching the plastic sheets to the frame, or other types of reservoirs might be used.

The body 44 of the chassis 22, as seen in Figures 2 and 7, is provided with a fill port 52 for filling the reservoir 24. After filling the reservoir, a spherical plug 54 is inserted into the fill port 52 to prevent the escape of ink through the fill port. In the illustrated embodiment, the plug is a polypropylene ball that is press fit into the fill port.

The pump 26 on the chassis 22 serves to pump ink from the reservoir and supply it to the printer via the fluid outlet 28. In the illustrated embodiment, the pump 26 includes a pump chamber 56 that is integrally formed with th chassis 22. The pump chamber is defined by a skirt-like wall 58 which xt nds downwardly from th body 44 of the chassis 22.

A pump inl t 60 is formed at the top of the chamber 56 to allow fluid communication between the chamber 56 and the ink reservoir 24. A pump outlet 62 through which ink may be expelled from the chamber 56 is also provided. A valve 64 is positioned within the pump inlet 60. The valve 64 allows the flow of ink from the ink reservoir 24 into the chamber 56 but limits the flow of ink from the chamber 56 back into the ink res rvoir 24. In this way, when the chamber is depressurized, ink may be drawn from the ink reservoir, through the pump inlet and into the chamber. When the chamber is pressurized, ink within the chamber may be expelled through the pump outlet.

In the illustrated embodiment, the valve 64 is a one-way flapper valve positioned at the bottom of the pump inlet. The valve 64 is a rectangular piece of flexible material positioned over the bottom of the pump inlet 60 and heat staked to the chassis 22 at the midpoints of its short sides (the heat staked areas are darkened in Figure 7). When the pressure within the chamber drops sufficiently below that in the reservoir, the unstaked sides of the valve each flex downward to allow the flow of ink around the valve 64, through the pump inlet 60 and into the chamber 56.

A flexible diaphragm 66 encloses the bottom of the chamber 56. The diaphragm 66 is slightly larger than the opening at the bottom of the chamber 56 and is sealed around the bottom edge of the wall 58. The excess material in the oversized diaphragm allows the diaphragm to flex up and down to vary the volume within the chamber. In the illustrated ink supply, displacement of the diaphragm allows the volume of the chamber 56 to be varied by about 0.7 cubic centimeters. The fully expanded volume of the illustrated chamber 56 is between about 2.2 and 2.5 cubic centimeters.

A pressure plate 68 and a spring 70 are positioned within the chamber 56. The pressure plate 68 is positioned within the chamber 56 with the lower face 72 adjacent the flexible diaphragm 66. The upper end of the spring 70, which is stainless steel in the illustrated embodiment, is retained on a spike 82 formed in the chassis and the lower end of the spring 70 is retained on the spike 78 on the pressure plate 68. In this manner, the spring biases the pressure plate downward against the diaphragm to increase the volume of the chamber.

A conduit 84 joins the pump outlet 62 to the fluid outlet 28. In the illustrated embodiment, the top wall of the conduit 84 is formed by the lower member of the frame 46, the bottom wall is formed by the body 44 of the chassis, one side is enclosed by a portion of the chassis and the other side is enclosed by a portion of one of the plastic sheets.

As illustrated in Figures 2 and 7, the fluid outlet 28 is housed within a hollow cylindrical boss 99 that extends downward from the chassis 22. The top of the boss 99 op ns into the conduit 84 to allow ink to flow from the conduit into th fluid outlet. A spring 100 and sealing ball 102 are positioned within the boss 99 and are held in place by a compliant septum 104 and a crimp cover 106. The septum 104 is inserted into the boss 99

and compresses the spring 100 slightly so that the spring biases the sealing ball 102 against the septum 104 to form a seal. The crimp cover 106 fits over the septum 104 and engages an annular projection 108 on the boss 99 to hold the entire assembly in place.

In th illustrated embodiment. both the spring 100 and the ball 102 are stainless steel. The sealing ball 102 is sized such that it can move freely within the boss 99 and allow the flow of ink around the ball when it is not in the sealing position. The septum 104 is formed of polyisoprene rubber and has a concave bottom to receive a portion of the ball 102 to form a secure seal. The septum 104 is provided with a slit 110 so that it may be easily pierced without tearing or coring. The slit is normally closed. A hole 112 is provided so that the crimp cover 106 does not interfere with the piercing of the septum 104.

With the pump 26 and fluid outlet 28 in place, the ink reservoir 24 can be filled with ink. To fill the ink supply 24, ink can be injected through the fill port 52. As ink is being introduced into the reservoir, a needle (not shown) can be inserted through the slit 110 in the septum 104 to depress the sealing ball 102 and allow the escape of any air from within the reservoir.

Of course, there are a variety of other methods which might also be used to fill the present ink supply. In some instances, it may be desirable to flush the entire ink supply with carbon dioxide prior to filling it with ink. In this way, any gas trapped within the ink supply during the filling process will be carbon dioxide, not air. This may be preferable because carbon dioxide may dissolve in some inks while air may not. In general, it is preferable to remove as much gas from the ink supply as possible so that bubbles and the like do not enter the print head or the trailing tube. To this end. it may also be preferable to use degassed ink to further avoid the creation or presence of bubbles in the ink supply.

Although the ink reservoir 24 provides an ideal way to contain ink, it may be easily punctured or ruptured and may allow a small amount of water loss from the ink. Accordingly, to protect the reservoir 24 and to limit water loss, the reservoir 24 is enclosed within the protective shell 30. In the illustrated embodiment, the shell 30 is made *of* polypropylene. A thickness of about one millimeter has been found to provide robust protection and to prevent unacceptable water loss from the ink. However, the material and thickness of the shell may vary in other embodiments.

The top of the shell 30 has contoured gripping surfaces 114 (Figure 6) that are shaped and textured to allow a user to easily grip and manipulate the ink supply 20. A vertical rib 116 having a detent 118 formed near its lower end projects laterally from each side of the shell 30. Th bas of th sh ll 30 is op n to allow insertion of the chassis 22. A stop 120 xtends lat rally outward from each side of wall 58 that defin s the chamber 56 (Figure 2). These stops 120 abut the lower edg of the shell 30 when the chassis 22 is ins rted.

After the reservoir is filled. the protective cap 32 is fitted to the bottom of the shell 30 to maintain the chassis 22 in position. The cap 32 is provided with slots 128 which receive the stops 120 on the chassis 22. In this manner. the stops are firmly secured between the cap and the shell to maintain the chassis in position. The cap aperture 34 allows access to the pump 26. and aperture 36 allows access to the fluid outlet 2E. The cap 32 obscures the fill port 52.

In the illustrated embodiment. the bottom of the shell 30 is provided with two circumferential grooves 122 which engage two circumferential ribs 124 formed on the cap 32 to secure the cap to the shell. Sonic welding or some other mechanism may also be desirable to more securely fix the cap to the shell. In addition, a label can be adhered to both the cap and the shell to more firmly secure them together. A pressure sensitive adhesive is used to adhere the label in a manner that prevents the label from being peeled off and to help secure the cap to the shell.

The attachment between the shell and the cap should, preferably, be snug enough to prevent accidental separation of the cap from the shell and to resist the flow of ink from the shell should the ink reservoir develop a leak. However, it is also desirable that the attachment allow the slow ingress of air into the shell as ink is depleted from the reservoir to maintain the pressure inside the shell generally the same as the ambient pressure. Otherwise, a negative pressure may develop inside the shell and inhibit the flow of ink from the reservoir. The ingress of air should be limited, however, in order to maintain a high humidity within the shell and minimize water loss from the ink.

In the illustrated embodiment, the shell 12 and the flexible reservoir 14 which it contains have the capacity to hold approximately thirty cubic centimeters of ink. The shell is approximately 73 millimeters wide, 15 millimeters thick, and 60 millimeters high. Of course, other dimensions and shapes can also be used depending on the particular needs of a given printer.

The shell 30 is substantially symmetrical about is vertical central axis. Accordingly. the shell may be joined with the cap in either of two orientations of the shell, thereby simplifying the container assembly process.

In accordance with the present invention, it is contemplated that the components of the ink supply container, except for the protective cap 32, may be used to contain any of a number of different types of ink. On can divide types of ink, for example, into two subcategories: family and color. A family of ink refers to the particular chemical and physical properties of the ink, such as its viscosity or solubility in water. Ink-jet pens and print heads that are designed to work with ink of a particular family will malfunction if ink of a different family is used. The ink color relat s to one of four colors that are typically used in color printing and combined on the printing medium to yield th sought-aft r color output. In this regard, the ink deliv ry system for providing ink

to the print head is limited to use with only one color and, therefore, must not be contaminated with ink of another color.

The protective cap 32 of the present invention includes features formed thereon to provide indicia of the particular single family and color of the ink contained in the reservoir. Similar features are provided in the docking station bays. These features on the ink container and in the docking station bays are the primary components of a system that prevents insertion of any ink containers into a particular bay, except for the single ink supply container that has a cap bearing the appropriate features for mating with corresponding features of the particular bay.

In accordance with the present invention, one end of the cap 32 is provided with features comprising projecting keys 130 that can identify the family of ink contained within the ink supply. For example, if the ink supply is filled with ink suited for use only with a particular printer or family of printers, a cap having keys of a selected number and spacing (in the illustrated embodiment, three evenly spaced keys 130 are shown) for indicating that ink family is contained in the supply. The other end of the cap is provided with a feature, a keyway 131, that is indicative of a certain color of ink, such as cyan, magenta, etc. As will be explained below, the docking station in the printer carries features that mate with those on a cap to control the insertion of the containers into the station.

It is notable here that the chassis 22 and shell 30 can be manufactured, assembled and stored without regard to the particular type of ink they will contain. Then, after the ink reservoir is filled, a cap bearing features indicative of the particular ink type within the reservoir is attached to the shell. This allows for manufacturing economies because a supply of empty shells and chassis can be stored in inventory. When there is a demand for a particular type of ink, that ink can be introduced into the ink supply and an appropriate cap fixed to the ink supply. Thus, this scheme reduces the need to maintain high inventories of ink supplies containing every type of ink.

Alternative or supplementary ink content indicia may be incorporated into the cap. For example, when the ink supply is filled with a particular color of ink, a cap that is colored to match that color may be used. The color of the cap may also be used to indicate the family of ink contained within the ink supply.

The illustrated ink supply 20 is ideally suited for insertion into a docking station 132 like that illustrated in Figures 4-7. The docking station 132 illustrated in Figure 4, is intended for use with a color printer. Accordingly, it has four side-by-side docking bays 38, each of which can receive one ink supply container 20 of a different color. The structure of the illustrated ink supply allows for the supply to be relatively narrow in width. This allows for four ink supplies to be arranged side-by-side in a compact docking station without unduly increasing the "footprint" of the printer.

The docking bays 38 reside between opposing walls 134, 136 of the station. Each wall respectively defines four inwardly facing vertical channels 138a-d, 140a-d. Each bay 38 (the upper boundary of one bay is shown in dashed lines in Figures 4-6) receives one ink supply 20.

A leaf spring 142 having an engagement prong 144 is positioned within the lower portion of each channel 138a-d, 140a-d. The engagement prong 144 of each leaf spring 142 extends inwardly into the docking bay 38 and is biased inward by the leaf spring.

Each of the channels 138a-d formed in one wall 134 of the station (for convenience referred to as the left wall) is shaped to define features that mate with a keyway 131 formed in the protective cap 32. Figure 5 best illustrates the configuration of the features in the left wall 134, where the individual channels 138a-d each have discrete keying characteristics.

Turning to an exemplary channel 138d in the left wall 134, it is seen that channel 138d has a protruding key 133 defined between its sidewalls 135. With reference to Figure 6, the protruding key 133 is a generally elongated member extending in the vertical direction between the parallel side walls 135 of the channel 138d. In a preferred embodiment, the key 133 is in two parts: an upper part that is located at the upper end of the wall 134, and a lower part that extends from the bottom of the wall 134 to a location just beneath the prong 144 that resides in the channel 138d.

The thickness (measured vertically in Figure 5) of the key 133, and the spacing of that key between the sidewalls 135 of the channel 138d, is established to mate with a keyway 131 formed in the end of a particular protective cap 32. In this regard, attention is directed to Figure 3D, which is a bottom view of the cap 32 depicted in Figure 1. That cap is configured on one end (the left end in Figure 3D) so that the width of that end part between the sidewalls 139 is just slightly less than the space between the sidewalls 135 of the channel 138d. Moreover, the width of the keyway 131 is just slightly wider than the thickness of the key 133 in that channel 138d. Put another way, the configuration of the cap end illustrated in Figure 3D is essentially the mirror image of the configuration of channel 138d (Figure 3D is a bottom view and Figure 5 is a top view). Accordingly, the left end of the version of the cap 32 shown in Figure 3D will mate with, and only with, the channel 138d in the left wall 134.

The right end of the cap, as mentioned earlier, includes three evenly spaced projecting keys 130 that may be indicative of a particular family of ink used with the illustrated docking bay. The channels 140a-d in the wall 136 of the docking station are constructed at their tops and bottoms (see Figure 4) to define three evenly spaced apart keyways 143 that mate with the family keys 130 on the cap. Specifically, the keyways 143 are defined as the spaces between upper and lower protru-

sions extending between the sidewalls of the channels 140a-d. Like the keys 133 in the opposing wall 134, these protrusions are in two parts, at the top and bottom of the channels, as shown in Figure 4.

Turning to Figures 3A-C and Figure 5, it will be appreciated that, with the foregoing in mind, the configurations of the other channels 138a-c in the left wall 234 of the docking station define features that will mate only the container caps that have correspondingly shaped features on the associated end of the caps. For example, the end of the cap depicted in Figure 3A (for reference called the "black ink" cap) is constructed so that the gap between the sidewalls 139 of that end is relatively narrower than that dimension of other caps. The end of the black ink cap (Figure 3A) fits snugly within a correspondingly narrow channel 138a in the left wall 134 of the docking station. The black ink cap does not include a keyway in the end of that cap 32, and the channel 138a does not include a distinct key.

The ends of the caps depicted in Figures 3B and 3C illustrate alternative arrangements of cap configurations that include keyways 131 located and sized for mating with only one of the channels 138b or 138c, respectively.

It is contemplated that more than just four different caps, associated with four different colors, can be employed with the keying system of the present invention. In this regard, the width of the associated end of the cap and the location of keyways on the cap (and keys in the docking bay channels) may be designed in any of a multitude of configurations, provided that the configuration for a particular cap is unique to a pen color, and that the keying system permits the fluid outlet 28 of the supply 20 and the pump 26 to respectively align with the fluid inlet 42 and actuator 40 of the docking bay.

In addition to controlling insertion of a particular ink container into its corresponding, mating, bay, it will be appreciated that the above-described key features also serve to guide movement of the container into and out of the bay. In this regard, the vertical length of the keys and keyways are selected so that as the container is moved into the bay the container is limited to sliding translational motion to facilitate precise interconnection between the fluid outlet 28 and fluid inlet 42.

As illustrated in Figures 6 and 7, the upper end of each actuator 40 extends upward through the aperture 148 in the base plate 146 of the station 132 and into the docking bay 38. The lower portion of the actuator 40 is positioned below the base plate and is pivotably coupled to one end of a lever 152 which is supported on a pivot point 154. The other end of the lever 152 is biased downward by a compression spring (not shown). In this manner, the force of the compression spring urges the actuator 40 upward. A cam 158 mounted on a rotatabl shaft 160 is positioned such that rotation of the shaft to an engaged position causes th cam to overcom th force of the compression spring and move the actuator 40 downward. Movem nt of the actuator causes the pump 26 to draw ink from the reservoir 24 and supply it through the fluid outlet 28 and the fluid inlet 42 to the printer.

As seen in Figure 7, the fluid inlet 42 is positioned within the housing 150 carried on the bas plat 146. The illustrated fluid inlet 42 includes an upwardly extending needle 162 having a closed blunt upp r end 164, a blind bore 166 and a lateral hol 168 near the blunt end. A trailing tube (not shown) is connected to the lower end of the needle 162 such that the blind bore 166 is in fluid communication therewith. The trailing tube 169 leads to a print head (not shown).

A sliding collar 170 surrounds the needle 162 and is biased upwardly by a spring 172. The sliding collar 170 has a compliant sealing portion 174 with an exposed upper surface 176 and a lower surface 178 in direct contact with the spring 172. In addition, the illustrated sliding collar includes a substantially rigid portion 180 extending downwardly to partially house the spring 172. An annular stop 182 extends outward from the lower edge of the substantially rigid portion 180. The annular stop 182 is positioned beneath the base plate 146 such that it abuts the base plate to limit upward travel of the sliding collar 170 and define an upper position of the sliding collar on the needle 162. In the upper position, the lateral hole 168 is surrounded by the sealing portion 174 of the collar to seal the lateral hole, and the blunt end 164 of the needle is generally even with the upper surface 176 of the collar.

To install an ink supply 20 within a docking bay 38, a user can simply place the lower end of the mating ink supply container between the opposing walls 134 and 136 that define a mating bay 38 (Figure 6). The ink supply is then pushed downward into the installed position, shown in Figure 7, in which the bottom of the cap 32 abuts the base plate 146. As the ink supply is pushed downward, the fluid outlet 28 and fluid inlet 42 automatically engage and open to form a path for fluid flow from the ink supply to the printer. Once the supply is installed, the actuator may enter the aperture 34 in the cap 32 to pressurize the pump.

Once in position, the engagement prongs 144 on each side of the docking station engage the detents 118 formed in the shell 30 to firmly hold the ink supply in place. The leaf springs 142, which allow the engagement prongs to move outward during insertion of the ink supply, bias the engagement prongs inward to positively hold the ink supply in the installed position. Throughout the installation process and in the installed position, the edges of the ink supply 20 are captured within the vertical channels 138 and 140 which provide lateral support and stability to the ink supply. The above-described keying components formed in bottom parts of the chann ls 138a-d and 140a-d are configured to provide clearance for th d t nts 118 and the central v rtical ribs 116 form d in each side of the sh ll. In a pr f rred embodiment, th depth (m asured left-to-right in Figure 5) is suffici nt to provid clearance for the detent 118 and rib 116, which may protrude outwardly slightly farther than

the end of the cap 32. Similarly, the depth of the central one of th three keyways 143 in the right station wall 136 is sufficiently deep to provide clearance for the detent 118 and rib 116 on that side of th supply container.

To remov the ink supply 20, a user simply grasps the ink supply, using the contoured gripping surfaces 114, and pulls upward to overcome the force of the leaf springs 142. Upon removal, the fluid outlet 28 and fluid inlet 42 automatically disconnect and reseal leaving little, if any, residual ink and the pump 26 is depressurized to reduce the possibility of any leakage from the ink supply.

This detailed description is set forth only for purposes of illustrating examples of the present invention and should not be considered to limit the scope thereof in any way. Clearly, numerous additions, substitutions, and other modifications can be made to the invention without departing from the scope of the invention which is defined in the appended claims and equivalents thereof.

Claims

1. A system for locating an ink supply container in an ink-jet printer, comprising

   a plurality of ink supply containers (20);
   a docking station (132) connected to the printer, the docking station having wall members that define a plurality of bays (38), each bay configured to mate with a supply container that is inserted into the bay and that contains a color of ink corresponding to that particular bay;
   first keying components (138, 140) attached to the station; and
   second keying components (130, 131) attached to the supply containers to define in conjunction with the first keying components a system that restricts the insertion of a container into a bay to only a mating container that contains the color of ink corresponding to that mating bay.

2. The system of claim 1 wherein each bay (38) of the docking station includes an inlet (42) and wherein each container includes an outlet (28) that can couple with an inlet, and wherein the first and second keying components are located to guide insertion of a mating container into its mating bay so that the inlet of the mating bay couples with the outlet of the mating container.

3. The system of claim 2 wherein the first and second keying components comprise elongat d members that constrict movement of th mating container within a mating bay to sliding translational movement.

4. The system of claim 1 wher in th k ying system further comprises a detent member (118) on each container and a prong member (144) on each bay (38), the prong member engaging the detent member to resist removal of the contain r from the bay.

5. The system of claim 4 wherein the location and configuration of the detent members on each container and the prong members on each bay are substantially identical irrespective of variations in the location and configuration of the first and second keying components among the containers and bays.

6. The system of claim 5 wherein each container comprises:

   a shell (30); and
   a cap (32) attached to the shell and defining on one end thereof a first feature (130) indicative of the family of ink to be contained in the container, and defining on the other end thereof a second feature (131) indicative of the color of ink to be contained in the container.

7. The supply container of claim 6 wherein the first feature (130) comprises at least one key and wherein the second feature (131) comprises a keyway.

8. A method of manufacturing an ink supply container to include features indicative of the type of ink contained in the container, the method comprising the steps of:

   providing a cap (32);
   forming on the cap a feature (130) at a predetermined location on the cap, wherein the location is indicative of a particular one type of ink;
   providing a shell (30) for containing a reservoir of ink, the shell lacking any perceptible indicia of the type of ink to be contained in the reservoir; and
   attaching the cap to the shell.

9. The method of claim 8 including the step of forming on the cap (32) a second feature (131) indicative of a family of ink to be contained in the container.

10. The method of claim 8 wherein the attaching step includes covering with the cap (32) a port that is used for filling the reservoir.

FIG. 1

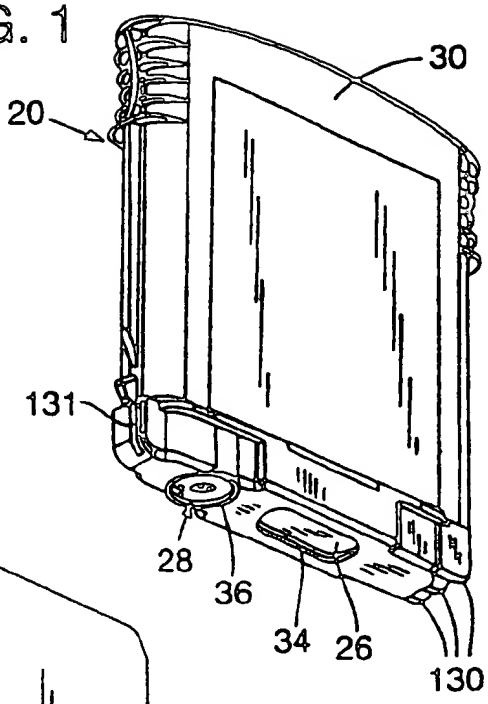

30
20
131
28
36
34
26
130

FIG. 2

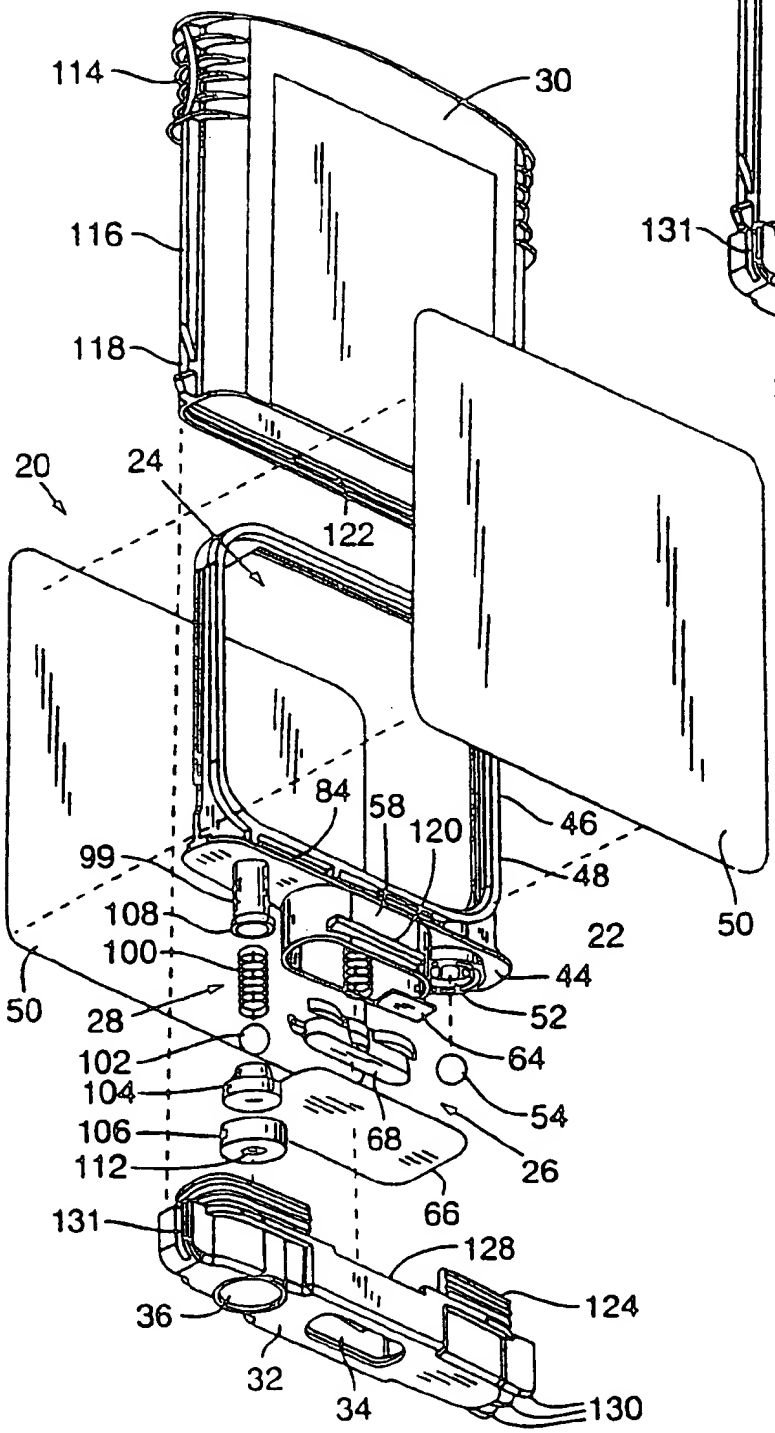

114
30
116
118
20
24
122
84
58
120
46
99
48
108
22
50
100
44
50
28
52
102
64
104
54
106
68
26
112
66
131
128
124
36
32
34
130

FIG. 5

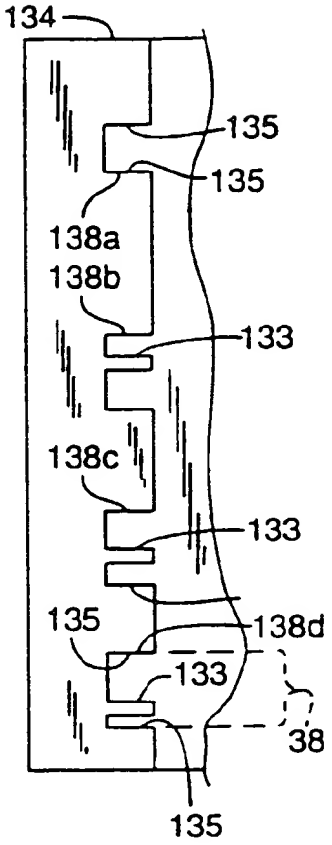


FIG. 3A

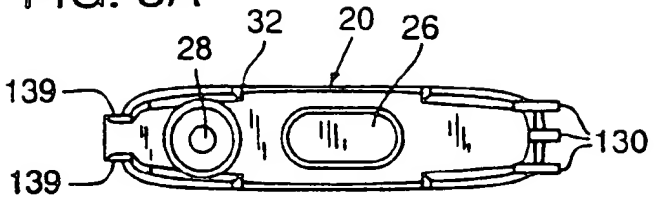


FIG. 3B

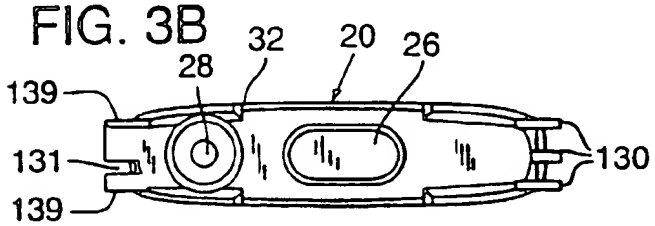


FIG. 3C

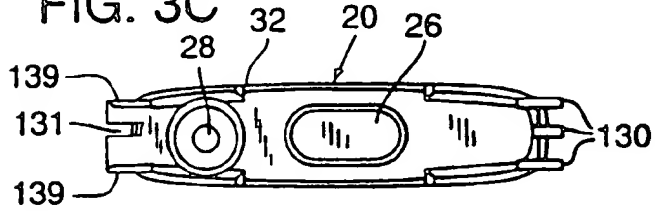
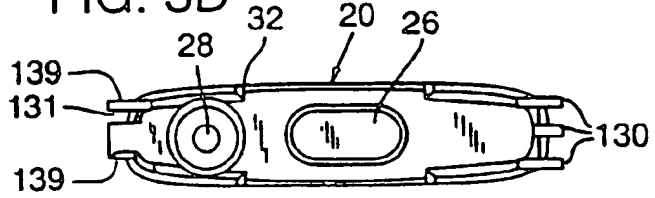


FIG. 3D



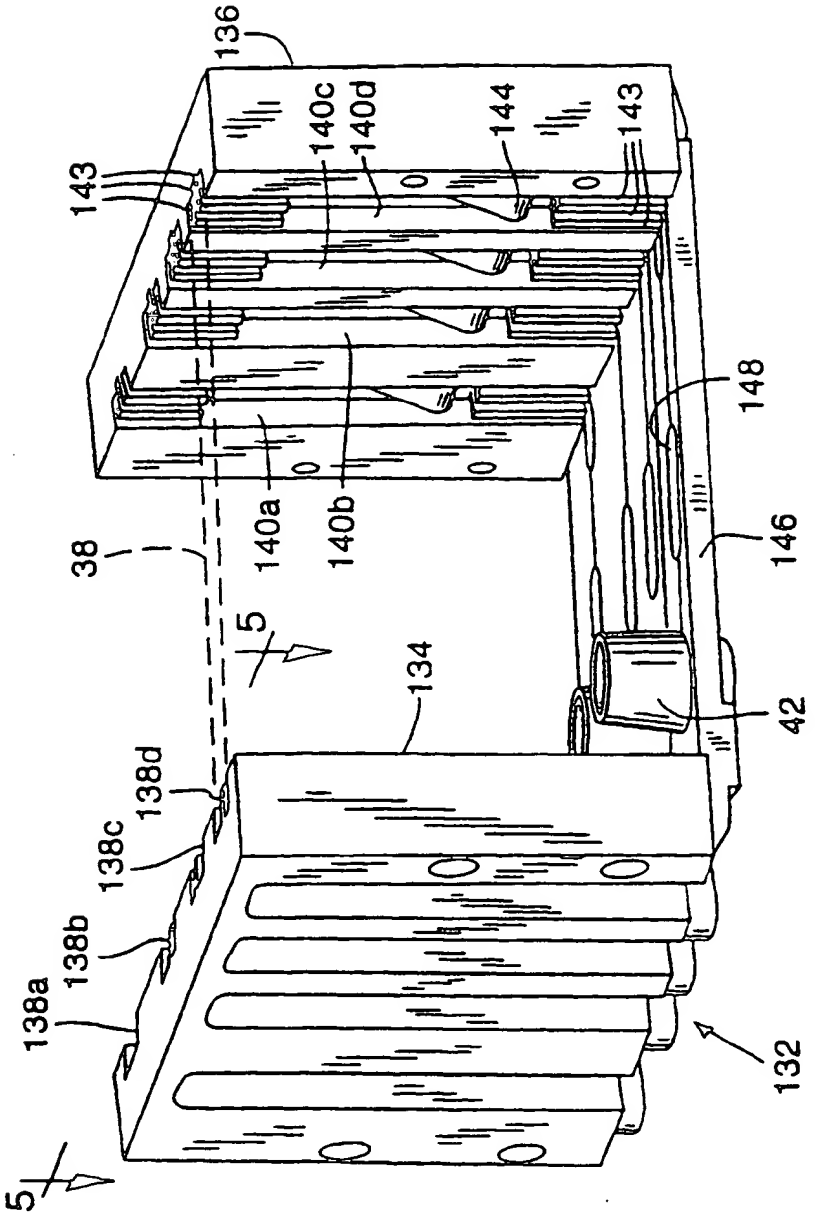
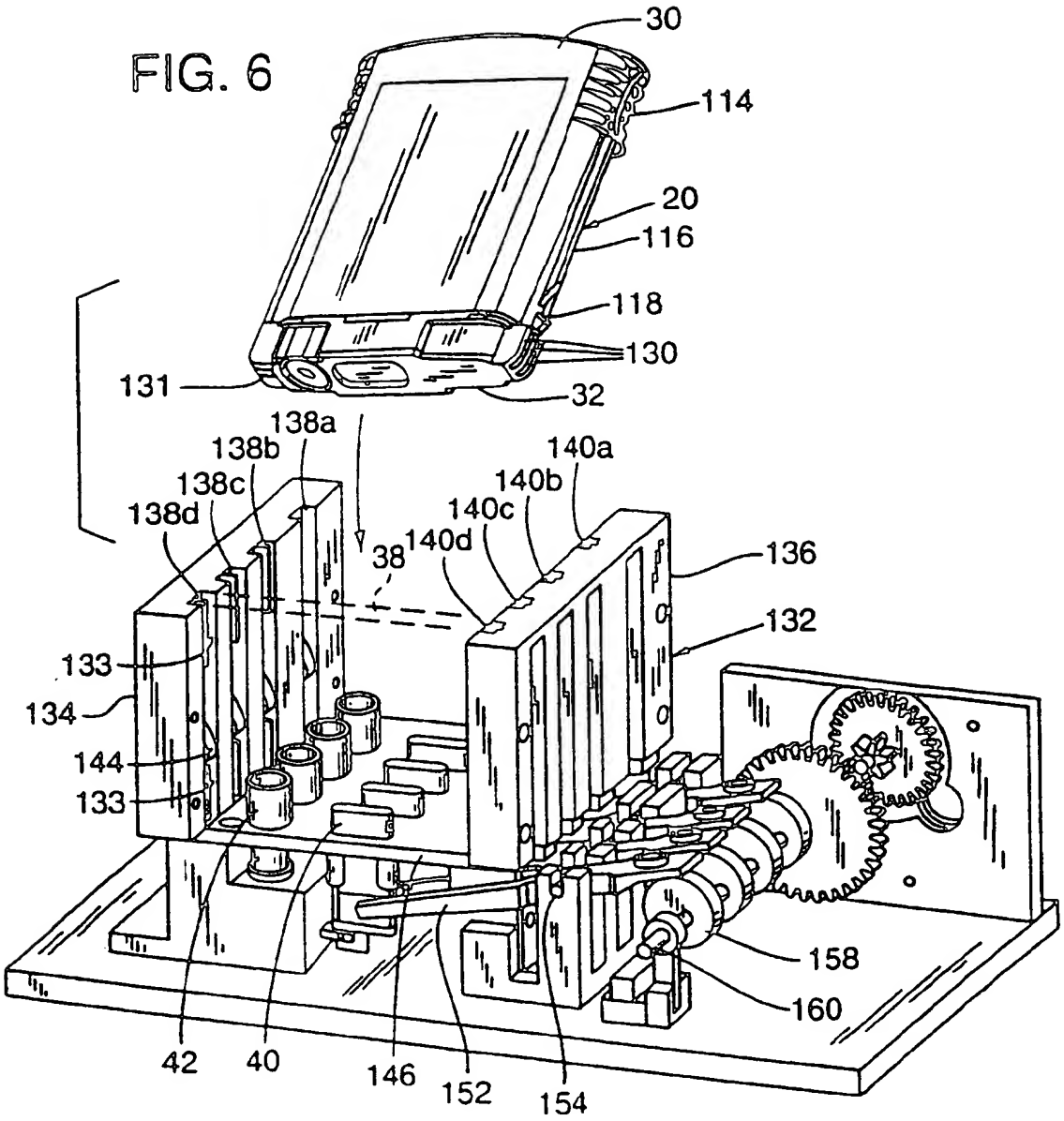

136
140c
140d
144
143
143
148
146
38
140a
140b
5
5
134
42
138d
138c
138b
138a
132

FIG. 4

FIG. 6


30
114
20
116
118
130
131
32
138a
138b
138c
138d
140a
140b
140c
140d
38
136
132
133
134
144
133
158
160
42
40
146
152
154

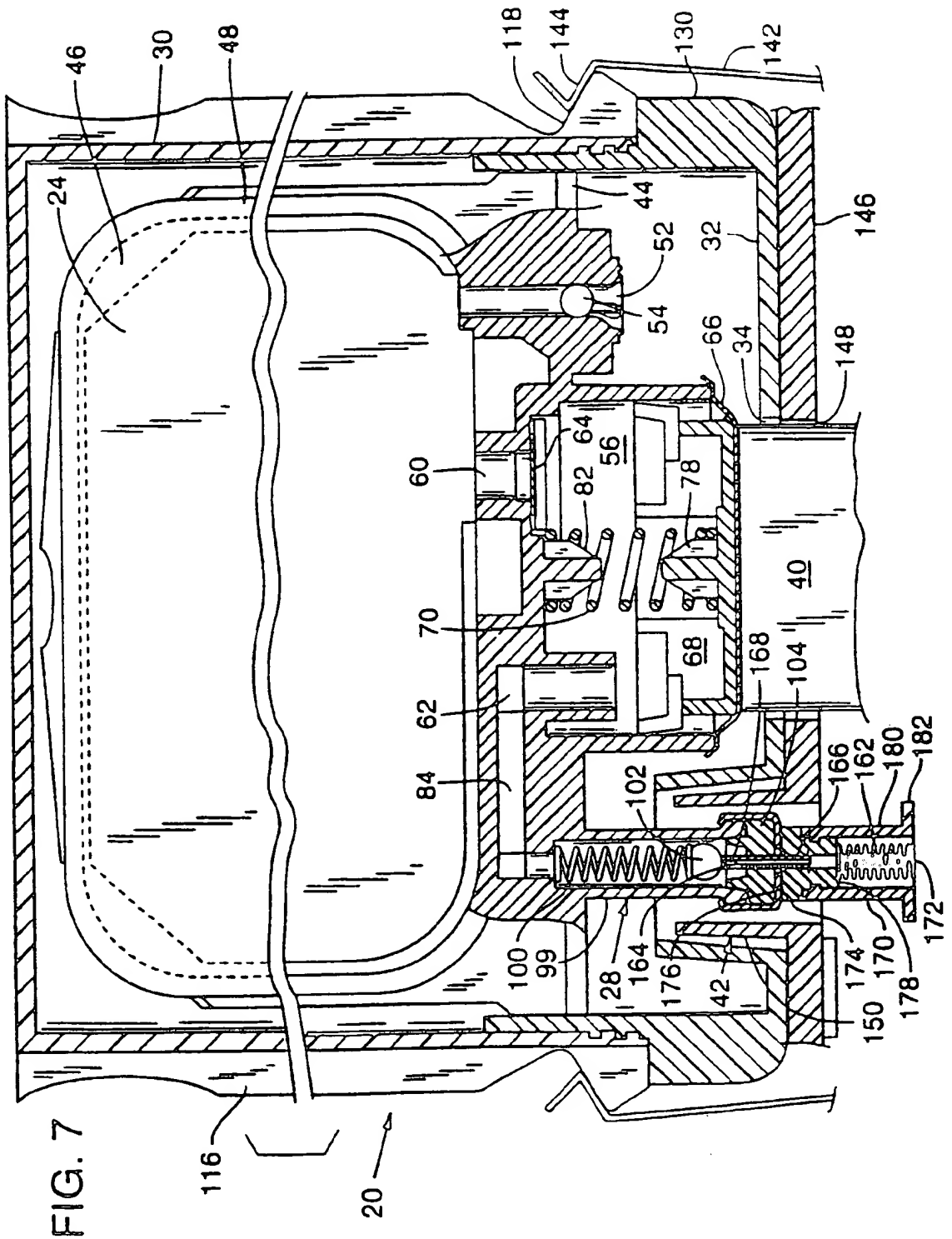

46
30
48
118
144
130
142
24
44
146
52
32
54
66
34
148
64
56
60
82
78
40
70
68
168
104
62
84
102
166
162
180
182
100
99
28
164
176
42
174
170
178
150
172
116
20

FIG. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 6871 . 3

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 4 853 708 A (M.A. WALTERS) * the whole document * ---	1-5	B41J2/175
A	US 4 737 801 A (H. ICHIHASHI) * column 17, line 51 - column 19, line 37 * * figures 15-18 * ---	1	
Y A	US 4 907 019 A (R.M. STEPHENS) * the whole document * ---	6-9 1	
Y	US 4 568 954 A (M.D. ROSBACK) * column 4, line 13 - column 5, line 53 * * figures 1,7 * -----	6-9	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B41J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 January 1997	Van den Meerschaut,G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)